of little efforts. We find that technical education has been made to include all sorts of subjects, even music. Several Councils give grants to classes formed for the exclusive study of music, either instrumental or vocal. The following selection of subjects taught will give some idea of the variegated nature of "technical" work: farriery, straw-plaiting, basket-making, ploughing, draining and dyking, clicking, cabinet-making, thatching, sheep-shearing, fishing, sail-making, china-painting, hat-manufacture, type-writing, political economy, life-saving, and house-decoration. So long as such subjects absorb the attention of Committees, little national advancement is possible. Instruction in the dodges of the workshop may produce a more dexterous and quicker workman, but it does nothing to educate him in those broad principles which enable him to assist intelligently in the real improvement of industry.

THE spirit of rivalry which regulates the conduct of educational institutions in some of our large towns is to be deplored, for its effects are detrimental to the advance of education. Reports, received from time to time, show that, in many districts, local institutions compete with one another instead of forming distinct steps in the educational ladder. So common is this kind of competition that it is refreshing to learn that the City Council and the School Board of Manchester have agreed between themselves that the Technical School shall discontinue its more elementary classes, and begin its curriculum at the points where the Board schools leave off. An effort is to be made to secure a corresponding gradation between the Technical School and Owens College. Manchester has thus taken important steps towards the solution of a difficult problem in public education, and it would be well if those provincial towns that have not already considered the correlation of their technical and scientific institutions would do so without delay. It is a question, indeed, whether a central authority ought not to be able to give a definite place in the educational ladder to the various institutions in a town, and to insist upon the absence of competition with one another. With each part of the engine doing its proper work, progress will be made; but if there is a confusion of functions, advance is impossible. The establishment, in recent years, of numerous technical institutions in many of our large provincial towns, and the extension of the work of old-established Mechanics' Institutes and Trade Schools, make it very necessary that something should be done to define the place of these institutions in our educational system. The University Colleges are especially affected by such institutions. Bristol, for instance, possesses one of the best University Colleges in the country; it has done excellent work, and will certainly do more. But during the past few years the Merchant Venturers' School has largely developed, and it is now a rival establishment situated only a few hundred yards from University College, with which it competes. This competition is no doubt responsible, to some extent, for the adverse balance of £950 in the accounts of University College, Bristol, for the year 1895; the total indebtedness of the College is now more than £6000. There is ample room for both institutions in Bristol, but the work of one should supplement, and not clash with, the work of the other. What is happening in Bristol is happening elsewhere, and is retarding educational advancement. In fact, we have no hesitation in saying that one of the most important points which needs to be settled at the present time is that which refers to the status of various institutions in the scheme of education.

SCIENTIFIC SERIALS.

American Journal of Science, January.—The quarries in the lava beds at Meriden, Conn., by W. M. Davies. The present condition of the quarries in the Triassic (Newark) formation near Meriden shows the vesicular upper surface of one lava bed under the dense basal portion of a later flow, and a number of fractures dislocating the double flow.—The form of isolated submarine peaks, by G. W. Littlehales. Theoretically the form of an isolated submarine peak would be that of a solid of revolution in which the crushing strength of any section is equal to the combined weight of the portion of the formation above that section and of the superincumbent body of water. The author derives a general equation for the slope of submarine peaks, and finds that the average slopes of Dacia Bank, Seine Bank, The Salvages, and Enderbury Island are fairly in accordance with the formula. This investigation has an important bearing upon the intervals at which deep-sea soundings should be taken in searching for probable shoals in the open ocean and in developing the character of the sea-bottom. The minimum radius at the bottom which a dangerous shoal can have, must vary directly with the depth, but on the average, in the deep sea, it may be stated as ten miles. An interval of ten miles, coupled with an interval of two miles, would be sufficient for general development, and would prove with certainty the existence or absence of any formation rising close to the surface.—On the epidote from Huntingdon, Mass., and the optical properties of epidote. This epidote is almost identical with that of Zillerthal, in Tyrol, but has the lowest percentage of iron oxides (6·2) and the lowest double refraction of any epidote recorded.—The iodometric determination of selenious and selenic acids, by F. A. Gooch and A. W. Peirce. The principle previously applied to the estimation of chlorates is equally advantageous for the determination of selenious and selenic acids. The selenious acid is treated with potassium iodide, di-hydrogen potassium arseniate, and half-strength sulphuric acid. The liquid is concentrated by boiling, the residue is cooled and the acid nearly neutralised with potassium hydroxide, acid potassium carbonate is added in excess of neutralisation, and, after the addition of starch, standard iodide is introduced until the starch-blue appears. The iodine introduced measures the arsenious acid, and the difference between it and the iodine, originally present in the form of the iodide, represents the amount set free by the selenious acid. Selenic acid, on the other hand, may be determined iodometrically with accuracy by first reducing it to the condition of selenious acid by treatment with potassium bromide in the presence of sulphuric acid, and then completing the reduction to the elementary condition by the treatment with potassium iodide and potassium arseniate.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, December 18, 1895.—Dr. Henry Woodward, F.R.S., President, in the Chair.—Prof. G. K. Gilbert, Washington, D.C., was elected a Foreign Member, and Dr. A. Penck, Vienna, was elected a Foreign Correspondent of the Society.—The tertiary basalt-plateaux of North-western Europe, by Sir Archibald Geikie, F.R.S. The author in this paper gave the results obtained by him in the continued study of Tertiary volcanic geology during the seven years which have elapsed since the publication of his memoir on "The History of Volcanic Action during the Tertiary Period in the British Isles." His researches have embraced the Western Islands of Scotland, St. Kilda, and the Faröe Islands. In an account of the rocks of the basalt-plateaux, attention was particularly directed in this paper to a type of banded basic lavas which played an important part in the structure of the volcanic districts both of the Inner Hebrides and of the Faröes. A number of examples were adduced of the volcanic vents which form a characteristic feature of the basalt-plateaux. The paper described in some detail the evidence for the flow of a large river across the lava-fields during the time when volcanic activity was still vigorous. Many additional details were given to illustrate the structure and behaviour of the basic sills which are so abundantly developed, especially at the base of the plateaux. The author added some additional particulars, more especially from Skye and St. Kilda, to his published account of the dykes which had taken so important a place in the origin and structure of the plateaux. Further observations were narrated regarding the great bosses of gabbro in the Inner Hebrides. The author, having been able to visit St. Kilda, described the junction of the granophyre of that remote island with the basalts and gabbros. He brought away a series of specimens and photographs which demonstrated that the acid rock had been injected into the basic masses, traversing them in veins and enclosing angular pieces of them. The granophyre was precisely like that of Skye and Mull, and was traversed by veins of finer material, as in these islands. By way of illustrating the probable history of the basaltic plateaux of North-western Europe, the author gave a short summary of the results of recent investigations of the modern volcanic eruptions of Iceland, especially of Th. Thoroddsen and A. Helland. Reference was made to the evidence of considerable terrestrial movement since the Tertiary volcanic period, as shown by the tilting of large sections of the plateaux in different directions, and also by the existence of actual faults. The concluding section of the paper dealt with the effects of denudation on the plateaux. The author remarked that there was certainly no other area in Europe where the study of the combined influence of atmospheric and marine denudation could be so admirably prosecuted, and where the imagination, kindled to enthusiasm by the contemplation of such scenery, could be so constantly and imperiously controlled by the accurate observation of ascertainable fact.—The British Silurian species of *Acidaspis*, by Mr. Philip Lake. Descriptions were given of those species of *Acidaspis* in the Silurian of Britain which have hitherto been incompletely described. The British forms were compared with those from the same system in Sweden and Bohemia. Five, out of nine, were represented by the same or very closely allied species in Sweden; two in Bohemia. All the Swedish forms except one were represented in Britain, and one in Bohemia as well as in Britain.

Royal Microscopical Society, December 18, 1895.—Mr. A. D. Michael, President, in the chair.—Mr. E. M. Nelson exhibited and described a portable microscope in which the stage had been enlarged to $4\frac{1}{2}'' \times 5''$, and the body fitted with three draw-tubes giving a range of length from $4\frac{3}{4}''$ to $12\frac{3}{4}''$.—A discussion on tube-length ensued, in which Mr. C. Beck, Mr. Nelson, and Mr. J. E. Ingpen took part.—Dr. H. C. Sorby gave an interesting account of his methods for preserving some of the more delicate marine organisms.—Mr. T. D. Ersser exhibited a new method for showing the multiplied images formed by the compound eyes of insects.—The President having reminded the Fellows that the meeting on January 15 would be their annual meeting, the list of Fellows recommended as officers and Council for the ensuing year was then read.

Mathematical Society, January 9.—Major Macmahon, R.A., F.R.S., President, in the chair.—Prof. Elliott, F.R.S., by a method used in connection with seminvariants, showed how to obtain a criterion as to whether or not a rational integral homogeneous function of y, a function of x, and its derivatives, is an exact differential, and further showed that if it is its integral can be found by differential operations only.—The President announced the title of a paper by Prof. Tanner, viz. on a certain ternary cubic. The paper, in the absence of the author, was taken as read. The notes chiefly relate to the automorphs and units of the form, and include a short geometrical discussion.—Mr. S. H. Burbury, F.R.S., made a further communication on Boltzmann's minimum function. Lieut.-Colonel Cunningham, R.E., and Dr. Larmor, F.R.S., joined in a discussion on the paper.—Mr. Love, F.R.S. (Hon. Sec.), communicated some examples illustrating Lord Rayleigh's theory of the stability and instability of certain fluid motions, and subsequently answered questions, bearing on the subject, by Dr. Larmor.

Entomological Society, January 15.—The sixty-third annual meeting, Prof. Raphael Meldola, F.R.S., President, in the chair.—After the balance-sheet had been read by one of the auditors, Mr. Goss read the report of the Council. It was announced that the following gentlemen had been elected as officers and Council for 1896: President, Prof. R. Meldola, F.R.S.; Treasurer, Mr. Robert McLachlan, F.R.S.; Secretaries, Mr. Herbert Goss and the Rev. Canon Fowler; Librarian, Mr. Geo. C. Champion; and as other members of the Council, Mr. Walter F. H. Blandford, Mr. Geo. F. Hampson, Prof. Edwd. B. Poulton, F.R.S., Mr. Osbert Salvin, F.R.S., Dr. D. Sharp, F.R.S., Mr. Roland Trimen, F.R.S., the Lord Walsingham, F.R.S., and Colonel J. W. Yerbury, R.A. It was announced that the President would appoint Dr. D. Sharp, Mr. Roland Trimen, and Mr. W. F. H. Blandford Vice-Presidents for the Session 1896–1897.—Prof. Meldola then delivered an address, in which he first drew attention to the remarkable literary activity of the entomologists of this country during the past year, referring particularly to the works recently published by Miall, Meyrick, Barrett, Rye, Lucas and Buckton, and to the new volume of the "Cambridge Natural History" by Sedgwick, Sinclair and Sharp. Attention was also called to the interesting discoveries in insect physiology by Latter and Hopkins. The main portion of the address was devoted to a plea for a more liberal use in biological work of the theoretical or speculative method which had proved so fruitful in other branches, and which, in the President's opinion, might with advantage be more freely employed in connection with entomological investigation. Illustrations were taken from the work of Bates on mimicry, Wallace on the colours of insects, and Poulton's researches on variable colouring, all of which had been prompted by hypothesis, and which had led to discoveries of large bodies of facts which would never have been gleaned by haphazard observation. In conclusion, the President referred to the losses by death during 1895 of many Fellows of the Society and other entomologists, special mention being made of Prof. Charles V. Riley, Prof. C. C. Babington, F.R.S., the Right Hon. T. H. Huxley, F.R.S., M. E. L. Ragonot, Major J. N. Still, Prof. Carl E. A. Gerstäcker, M.D., M. Claudius Rey, M. Jules F. Fallou, and Mr. W. H. Tugwell.

Royal Meteorological Society, January 15.—Annual meeting.—Mr. R. Inwards, President, in the chair.—The report of the Council showed that the Society was in a satisfactory condition, thirty-four new Fellows having been elected during the year. Mr. Inwards devoted his presidential address to the subject of meteorological observatories, which he illustrated with numerous lantern slides. After describing some ancient observatories, including the Nilometers and the Tower of the Winds at Athens, he gave an account of national observatories, of which the Royal Observatory, Greenwich, was taken as a type. High-level observatories were next described, of which that on Mont Blanc was taken as a type. Special reference was also made to the observatories on the Sonnblick, the high-level observatory at Arequipa on the Andes, and that on Ben Nevis. An account was next given of tower observatories, together with some of the results obtained from the Eiffel Tower at Paris. Mr. Inwards, in concluding, said: "One can figure to oneself a tower piercing the air from any of the elevated tablelands of this country—Salisbury Plain, the Stray at Harrogate, or the Downs between Guildford and Dorking—and from which the most interesting results could not fail to accrue. It is the opinion of M. Vallot—no mean authority—that a high tower is for air-observing purposes equivalent to a mountain station of ten times the altitude: and this is plain when one considers that any mountain must act as an obstacle which thrusts upward the strata of the atmosphere into a form almost like its own, so that some of the effects are very little different from those observed below; while a tower like the Eiffel Tower thrusts itself in the air without obstructing its movements. It is the boast of the Royal Meteorological Society that it is gradually covering the country with a network of private observing stations, and is collecting together, for the enlightenment of all future time, a mass of accurate knowledge on the subject of the changes in our atmosphere, its varying moods, its beating pulses, its calms and its convulsions, so that when the philosopher is born who is destined to unravel all its mysteries, he will have the tools and instruments ready to his hand."—Mr. E. Mawley was elected President for the ensuing year.

EDINBURGH.

Royal Society, December 2, 1895.—Prof. Geikie in the chair.—Before business proper was commenced, the Chairman, in reviewing the work of the past session, congratulated the Society on the reappointment of Lord Kelvin as President. This was the third time, he remarked, that the Edinburgh Royal Society had provided the Royal Society of London with a President. In referring to the successful completion of the *Challenger* Reports, for which the Society offered its heartiest congratulations to Dr. Murray, Prof. Geikie hoped that Government would be induced, by the publication of these results, to equip a proper expedition to the Antarctic regions.—Prof. Tait read a paper, by Lord Kelvin, on the application of network to a surface, in particular to a toroidal surface. Lord Kelvin had had his consideration directed to this subject, in connection with attempts to protect the pneumatic tyres of bicycles, which were examples of a toroidal surface. Dr. Noel Paton read a communication on the relationship of the liver to fats.—Mr. James Milne, gave an account of a mass of manufactured iron, which he found in the valley of the Rhone near the Glacier de la Plaine Morte. It bore the date 1807, and Mr. Milne was of opinion that it had been left there as a mark by an expedition which did some scientific work in the Alps in that year.

December 16, 1895.—Prof. Copeland, Vice-President, in the chair.—An obituary notice of the late Dr. Benjamin Carrington, by W. H. Pearson, Esq., was read by Prof. Tait.—Dr. C. Hunter Stewart, of the Public Health Laboratory, made two communications on allied subjects: Three years' daily determinations of the amount of carbonic acid in the atmospheric air, and in the ground air of Edinburgh; and on the physical and chemical examination of the soil, and the relation of the soil to the incidence of summer diarrhœa in Scotland.—

The result of his investigations on the first subject showed that the proportion of CO_2 in the atmosphere of Edinburgh in 1893 was 3·96, in 1894, 3·72, and in 1895, so far, 3·45 per ten thousand. Dr. Stewart contended that eventually the amount of CO_2 in the air depended on the nature of the soil, as the ground air was the source and regulator of the atmospheric. The ground soil of Edinburgh being clay, produced less carbon than a "travelled" and therefore porous soil. Passing to the second part of his subject, Dr. Stewart adduced statistics to show that, in the case of summer diarrhœa, the mortality was low when the soil was clay, and high when it was sandy.—Prof. Hartley, of Dublin, read a paper on the cause and nature of chemical changes in ocean deposits, and Dr. J. L. Kerr described a new method of making plaster of Paris.

PARIS.

Academy of Sciences, January 13.—M. A. Cornu in the chair.—Observations of the minor planet CH Charlois (January 8), made at the Observatory of Paris, by M. O. Callandreau.—The expenditure of energy in muscular work, by M. A. Chauveau. In the case of a muscle which is doing positive work, such as lifting a weight, the expenditure of energy by the muscle is divided by the author into two parts; one spent in displacing the weight, the other in sustaining it during the displacement. In the experimental study, the external work done in lifting a weight is measured directly, the energy changes in the muscles indirectly, by means of analyses of the inspired and expired air.—Note from the report of M. P. Ballif on the hydraulic works carried out in Bosnia-Herzegovina, and on the meteorology of the two provinces, by M. B. de la Grye.—On the variations in the ratio of the two specific heats of gases, by M. E. H. Amagat. From calculations of the values of the ratio of the specific heats of air at 50° C. under pressures varying from 1 to 50 atmospheres, widely differing results are obtained according as the determinations of the specific heat at constant volume by Joly, or those at constant pressure by Lussana, are taken as the basis of the calculation. The results of Joly are shown to be the most probable. The expression $p(v - \epsilon)^\gamma = \text{constant}$, where ϵ is $\frac{d(pv)}{dp}$ and p, v, and γ have their usual significations, is then developed, as giving the adiabatic expansion for fluids, including highly compressed gases. For low pressures ϵ is negligible, and the equation reduces to the ordinary form.—Observations of the minor planet CH Charlois, made at the Observatory of Toulouse, by M. F. Rossard.—On the nature of the solar prominences, by M. J. Fényi.—On the generalisation of the idea of the limit, and on the extension, to summable divergent series, of Abel's theorem on complete series, by M. E. Borel.—On the theory of cathode rays, by M. G. Jaumann. A reply to a note of M. H. Poincaré. The author thinks it is not necessary to modify his hypotheses to meet the objections of M. Poincaré.—Observations on the preceding communication, by M. H. Poincaré.—On Hall's phenomenon in liquids, by M. H. Bagard. An experimental proof of the existence of the Hall effect in a saline solution. The results for a solution of zinc sulphate are of the same order of magnitude as for metallic bismuth. The experiments contradict the conclusion previously arrived at by M. Roiti, that Hall's effect did not occur with liquids.—Acetylene as a photometric standard, by M. J. Violle. As a single chemical individual of high illuminating power now easily obtained in a state of purity, acetylene offers obvious advantages as a secondary photometric standard. A flat flame of acetylene burning under a pressure of 30 cm. of water, and used with a screen, gave perfectly satisfactory results.—On the heat of formation of some compounds of manganese, by M. H. Le Chatelier. Thermochemical data are given for the combustion in oxygen of manganese, its carbide and protoxide.—On the crystallised iodides of strontium and calcium, by M. Tassilly. A thermo-chemical paper.—On aldehydes derived from the isomeric alcohols $C_{10}H_{18}O$, by MM. Ph. Barbier and L. Bouveault.—On the multirotation of the reducing sugars and isodulcite, by M. Tanret.—Retinal oscillations resulting from luminous impression, by M. A. Charpentier.—On the formation of the duramen, by M. E. Mer.—On a new locality in France for *Pinus Salzmanni*, by M. G. Fabre.—Pliocene glaciers in the mountains of Aubrac, by M. G. Fabre.—On some anomalies in the temperature of subterranean springs, by M. E. A. Martel.—On the mechanical production of extreme temperatures, by M. E. Solvay. A note admitting the priority of Prof. Dewar in the use of vacuous envelopes for retarding heat radiation.—On a meteor observed at Chambéry, by M. Chabert, January 6, 5.15 p.m.; direction N.E. to S.W.

BERLIN.

Meteorological Society, December 3, 1895.—Prof. Hellmann, President, in the chair.—General von Tillo, of St. Petersburg, who was present as a guest, explained a series of charts giving the chief results of his observations on the distribution of terrestrial magnetism.—Dr. Fischer described in detail a thunderstorm which occurred over Silesia and Posen on September 30. It began at midnight in a region of low temperature, advanced very slowly, accompanied by very light or even no wind, and did not cease until the next night. The storm area was covered with dense mist, rain was slight and local, and the atmospheric pressure was maximal. This storm was therefore due to neither heat nor wind eddies.—Dr. Zenker spoke on the climate of Werchojansk, with special reference to its temperatures.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Plant-Breeding: L. H. Bailey (Macmillan).—N.S.W. Government Railways and Tramways. Annual Report of the Railway Commissioners for the Year ending June 30, 1895.—First Annual General Report upon the Mineral Industry of the United Kingdom for the Year 1894: Dr. C. Le Neve Foster (Eyre).—On the Deep and Shallow-Water Marine Fauna of the Kerguelen Region of the Great Southern Ocean: Dr. J. Murray (Edinburgh, Grant).

PAMPHLETS.—Von der Menschlichen Freiheit: Dr. H. Achter (Leipzig, Engelmann).—Review of the Mineral Production in India for 1894 (Calcutta).

SERIALS.—Quarterly Journal of Microscopical Science, January (Churchill).—American Journal of Psychology, Vol. vii. No. 2 (Worcester, Mass.).—Psychological Review, January (Macmillan).—North American Fauna, No. 10 (Washington).—Journal of the Franklin Institute, January (Philadelphia).—Journal of the Sanitary Institute, January (Stanford).—Palestine Exploration Fund Quarterly Statement, January (Watt).—Intles. Archiv für Ethnographie. Band viii. Heft 5 and 6 (Leiden, Brill).—Record of Technical and Secondary Education, January (Macmillan).—Nyt Magazine for Naturvidenskaberne. 34te Binds 3 die og 4 de Hefte, 35te Binds, 1 ste, 2 de og, 3 die Hefte (Christiania).

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